Question 2.

From the given data, we can see that the total supply is 276 (93+88+95) whereas, the demand is 284 (30+57+48+91+58). So, the company can not meet the demand with the current plan.

$W_{ij} \geq 0$: where i = A, B, C for pumps, j= 1,2,3 for wells, and R1 to 5 are refineries

Z_{min} = 1.52 W1A + 1.60 W1B + 1.40 W1C + 1.70 W2A + 1.63 W2B + 1.55 W2C + 1.45 W3A +1.57 W3B + 1.30 W3C + 5.15 WAR1 + 5.12 WBR1 + 5.32 WCR1 + 5.69 WAR2 + 5.47 WBR2 + 6.16 WCR2 +6.13 WAR3 + 6.05 WBR3 + 6.25 WCR3 + 5.63 WAR4 + 6.12 WBR4 + 6.17 WCR4 + 5.80 WAR5 + 5.71 WBR5 +5.87 WCR5

Constraints (Supply)

W1A +W1B + W1C <= 93

W2A + W2B + W2C <= 88

W3A + W3B + W3C <= 95

Constraints (Pumps to Refinery)

W1A + W2A + W3A = WAR1 + WAR2 + WAR3 + WAR4 + WAR5

W1B + W2B + W3B = WBR1 + WBR2 + WBR3 + WBR4 + WBR5

W1C + W2C + W3C = WCR1 + WCR2 + WCR3+ WCR4 + WCR5

Constraints (Demand)

WAR1 + WBR1 + WCR1 = 30

WAR2 + WBR2 + WCR2 = 57

WAR3 + WBR3 + WCR3 = 48

WAR4 + WBR4 + WCR4 = 91

WAR5 + WBR5 + WCR5 = 48

b) Network diagram for optimal solution

Wells: 1,2,3
Pumps: A, B, C
Refineries: 1,2,3,4,5